AD-A272 249



FINAL REPORT

Engineering Design, Fabrication,
Installation, Operation, and
Maintenance Services in Support of
Research on Laser Plasma Physics



This document has been approved for public researce and cale; its distribution is unamitted.



Best Available Copy

SECURITY CLASSIFICATION: Unclassified

SFA--93/005

Engineering Design, Fabrication, Installation, Operation, and Maintenance Services in Support of Research on Laser Plasma Physics

Prepared by:

Kevin Smith, Mariano Sy, and Joseph Chow

SFA, Inc.

1401 McCormick Drive

Landover, Maryland 20785

Date:

September 1993

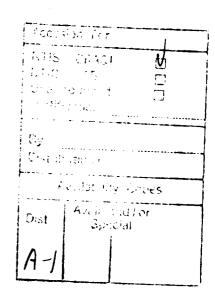
Contract Number:

N00014-92-D-2000

Prepared for:

Naval Research Laboratory 4555 Overlook Avenue, SW

Washington, DC 20375-5000



REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget. Paperwork Reduction Project (0704-0188), Washington, DC 20503.

Management and Budget. Paperwork Reduction	n Project (0					
AGENCY USE ONLY (Leave Black				PE AND DATES COVERED port 11/22/91 to 5/8/93		
4. TITLE AND SUBTITLE					5. FU	NDING NUMBERS
Engineering Design, Fabrication, Installation, Operation, and Maintenance Services in Support of Research on Laser Plasma Physics					N00014-92-D-2000	
6. AUTHOR(S)						
Kevin Smith, Mariano Sy, and Joseph Chow						
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)					8. PERFORMING ORGANIZATION REPORT NUMBER	
SFA, Inc. 1401 McCormick Drive					Q1	FA93/005
Landover, MD 20785					5,	·A93/003
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)					10. SPONSORING/MONITORING AGENCY REPORT NUMBER	
Naval Research Laboratory						
4555 Overlook Ave., SV Washington, DC 20375)				
11. SUPPLEMENTARY NOTES						
12a. DISTRIBUTION/AVAILABILITY STATEMENT				12b. DISTRIBUTION CODE		
12 ADSTDACT (Maximum 200 um						
13. ABSTRACT (Maximum 200 wo	oras)					
SFA provided research engineering layouts and sources and laser plass modified betatron to op	d mod ma ph	ifications for the vari ysics. SFA also reco	ous high nfigured	-power micro I the feeds of	wave a	and coherent radiation
14. SUBJECT TERMS						15. NUMBER OF PAGES 1 page
						16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT		CURITY CLASSIFICATION THIS PAGE		IRITY CLASSIFICA	TION	20. LIMITATION OF ABSTRACT
Unclassified		Unclassified		Unclassified		Unlimited

Introduction

The Plasma Physics Division of the Naval Research Laboratory (NRL) is involved in several projects related to the production, acceleration, and physical properties of high-energy, high-current electron beams. At the core of this effort is the modified betatron project. The goal of the modified betatron project is to accelerate a 1 kA electron beam to an energy of 50 MeV. The research program centers on the critical physics issues associated with this goal, such as beam stability, self field effects, image forces, and injection and extraction processes.

The modified betatron accelerator (MBA) is a large and complex facility. Several high-energy storage capacitor banks and pulsed power systems, with the associated distribution and coil systems, are required to create the various magnetic fields for acceleration and beam confinement and to supply the beam. In addition to the electrical components, the structural framework to support the betatron chamber must allow for precision positioning of the various coils and yet be able to withstand considerable forces and torques during a shot. Because of this complexity, an extensive amount of mechanical and electrical engineering is required to modify and/or fabricate new parts for the betatron.

Engineering Support

Under contract N00014-92-D-2000, SFA provided engineering support for the MBA project to the NRL Beam Physics Branch and by performing the following tasks:

- Provided preliminary engineering layouts and modifications for the various high-power microwave sources and laser plasma physics;
- Provided preliminary engineering layouts and modifications for the various high-power coherent radiation sources and laser plasma physics; and
- Reconfigured the feeds of the 12 resonant coils in the modified betatron to operate at a peak voltage as high as 55 kV.

Preparation of Preliminary Engineering Layouts

In cooperation with government scientists, SFA provided support to conceptualize research equipment that satisfied the structural, mechanical, electrical, vacuum, magnetic, electrostatic, cost, and schedule requirements of the project. SFA personnel prepared layout drawings, performed analyses for such properties as strength and deflection, and prepared modified drawings for the various high-power microwave and coherent radiation sources and for laser plasma physics.

Reconfiguration of Components of the Modified Betatron Accelerator

SFA personnel reconfigured the feeds of the 12 resonant coils in the modified betatron to operate at a peak voltage as high as 55 kV. The high voltage driver was connected to the coils with four RG-213 cables. To reduce the amplitude of the field error at the beam orbit, the loop at the input of the coils was kept as small as possible.